Does digital video enhance student learning in field-based experiments and develop graduate attributes beyond the classroom?

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Abstract

The connection between fieldwork and development of graduate attributes is explored in this paper. Digital technologies present opportunities to potentially enhance the learning experience of students undertaking fieldwork, and develop core digital attributes and competencies required by Higher Education Institutions (HEIs) and employers. This paper reports the success of adopting digital video capture in technology-rich field experiments that form part of final year undergraduate courses in Physical Geography at an HEI in New Zealand. Student perceptions were obtained via a range of approaches. Results suggest that deployment of digital video reinforces student learning and connects with core graduate attributes.

Key words: fieldwork, physical geography, pedagogy, videocasts, graduate attributes

Introduction

Fieldwork has long been perceived to lie at the heart of Geography (e.g. Sauer, 1956; Gold et al., 1991; Haigh & Gold, 1993; Kent et al., 1997; Pawson & Teather, 2002; Bracken & Mawdsley, 2004; Stoddart & Adams, 2004; Dummer et al., 2008; Herrick, 2010; Fuller, 2012). Accordingly, in a curriculum aligned with real world application, fieldwork ought to have a key role in the development of Geography students' graduate attributes. Graduate attributes have been defined as, "the qualities, skills and understandings a university community agrees its students would desirably develop during their time at the institution and, consequently, shape the contribution they are able to make to their profession and as a citizen" (Bowden et al., 2000, cited in Bridgstock, 2009). Haigh & Clifford (2011, p.575) report that the Quality Assurance Agency in Scotland defines graduates as ideally having key competencies including, "critical understanding informed by current developments in their subject, an ability to identify and analyse problems and to formulate and apply evidence based solutions and an ability to apply a systematic and critical assessment to complex problems and issues and deploy techniques of

analysis and enquiry." In a society that is now breeding 'digital natives', i.e. one who has grown up with digital technology (Prensky, 2001; 2009), it must be anticipated that a key attribute / skill / competency of the Geography graduate includes or incorporates a measure of enhanced digital literacy as part of the deployment of analytical techniques. Indeed, it could be argued that such an attribute be expected of any graduate of any discipline in today's society, and some institutions (e.g. Oxford Brookes University in the UK) explicitly cite digital literacy as a core graduate attribute across the institution. It is notable that an Oxford Brookes graduate will be considered to be a "confident adopter of a range of technologies for personal & professional use." (Oxford Brookes, 2013). Furthermore, JISC (2012) suggests that improving digital literacy is "an essential component of developing *employable* graduates."

It is therefore important that the signature pedagogy of Geography, defined as fieldwork by Hovorka & Wolf (2009), aligns with the desired attributes of the Geography graduate as per the expectations of HEIs and employers. This is particularly important if our signature pedagogy is to be perceived as remaining relevant to the modern day undergraduate. However, as Barrie (2008) has noted, there has been, at least in an Australian context, a gap between the rhetoric of graduate attributes and the student experience. Doing things the way we have always done them is no longer an option if this gap is to be closed, and the delivery of field-based teaching should adopt appropriate technologies that meet the needs of today's 'digitally native' graduates. This, effectively, is a digital outworking of Biggs' (1996) constructive alignment.

Incorporation of technology *per se* into field teaching has been perceived by academics to enhance fieldwork learning for a range of applications, as reviewed by Welsh et al. (2013). However, Welsh et al. (2013) also recognise that technology needs to be used effectively if learning is to be enhanced. This is also the case if concurrent and connected graduate attributes are to be developed and teaching practice and learning outcome are properly aligned. Surprisingly, Welsh et al. (2013) suggest that technology is, in fact, used least when students are actually out in the field, being more likely to be utilised during the stages of data analysis and write-up, which might suggest a disconnection between fieldwork teaching and anticipated graduate attributes.

This paper assesses the use of readily available digital technology in the field in New Zealand to facilitate student learning and engagement and ultimately connect with key graduate attributes. Since 2010 digital video technology has been incorporated into two final year undergraduate papers (modules / courses) in Physical Geography that have a strong emphasis on field-based experimentation. The experiments in these papers introduce students to the use of both sophisticated technology and standard field sampling procedures to acquire data in order to test a range of

hypotheses. Traditionally students find some of these approaches dull and repetitive and / or perceive them to be complex and involved. The intention of incorporating digital video into these field experiments is thus three-fold: (i) to increase the level of engagement and enjoyment involved in repetitive / standardised data collection, (ii) to improve the level of understanding of the method employed, particularly where new and unfamiliar equipment is being introduced and deployed, and (iii) to develop best practice in alignment with core graduate attributes. This paper seeks to evaluate student perceptions concerning incorporation of digital technologies into this type of fieldwork. Quantifying the student experience through video diaries, questionnaires and focus group methodologies captures the student voice as we seek to (i) establish the extent to which the intended outcomes of improved engagement and understanding are met, and (ii) consider what graduate attributes may be developed in this approach.

Institutional setting

At present, Massey University, a large teaching and research based institution where the research took place, is discussing the definition of discipline-specific graduate attributes, currently distilling the attributes of each of its graduates to three one word statements: 'creativity', 'innovation' and 'connectedness'. Within this broad framework, digital literacy is promoted as part of the institution's teaching and learning policy, stating in its strategy document that teaching and learning will "fully exploit opportunities provided by new digital media" (Massey University, 2013, p.8). Learning outcomes for papers taught at Massey are restricted to specific measurable outcomes relating to assessments and are not (currently) well connected with broader graduate attributes as a whole. Nevertheless, staff in the Geography Programme were keen to examine the development of graduate attributes through technology-aided fieldwork, given that fieldwork is the pedagogy of the discipline and offers a prime opportunity to develop personal knowledge, understanding, skills and values (Fuller, 2012), with learning enhanced by the integration of digital media (Welsh et al., 2013). Accordingly, our mapping of graduate attributes through technology-enhanced fieldwork is not specific to this institution. In New Zealand, a student's majoring subject comprises at least 50 % of papers taken for the degree, but as such this may mean that half of a Geography major is not within the subject. Most students studying the papers we report on were majoring in Geography. Other subjects included Planning and Earth Science. The courses were 3rd year (300 level) electives for all students.

Approach to teaching and assessment

Field experimentation deployed in this study is concerned with the investigation of fluvial processes and process geomorphology. Fluvial processes were studied by students in a series of short, 2-3 hour long field experiments using a stream local to the University campus. These experiments ran in the normal course of the teaching day and deployed equipment including electromagnetic flow meters, a robotic total station for detailed ground survey, cone penetrometer and standard grain size sampling tools (sieves and pebble template). Process geomorphology was studied as part of an 8-day residential fieldtrip at a site remote from the University and in a highly contrasting Alpine environment. Many of the students attending this field course were extramural (distance / correspondence) and for some it was not only their first fieldwork experience, but also their first contact with staff and peers. In addition to equipment described above, field experimentation used a high-precision Global Positioning System using Real Time Kinematic survey (RTK-dGPS). In both courses, students worked in self-selected groups of c.4 and had the responsibility of setting up and running the equipment to derive data which they interpreted in their own time or during the evenings of the residential fieldtrip. The intention of the fieldwork in both the courses was to provide hands-on technical experience measuring key parameters in rivers and the alpine landscape. Thus students become familiar with technology used in these contexts, as well as having the opportunity to learn 'by doing', which according to Race (1993) is when students learn best, particularly in such an active learning setting (Higgitt, 1996), adopting these experiential learning approaches (Kolb, 1984; McEwen, 1996).

These theatres of learning thus encourage best pedagogic practice (Fuller, 2012), but to modify a phrase from Reformed Theology, *Academia semper reformanda* the *Academy* is always reforming, particularly in the light of developing graduate attributes, and there is a need to keep pace with opportunities to develop and improve our practice. Accordingly, from 2010 digital technology was introduced in the form of video cameras (digital cameras with a video function and Flip Videos) to report on methods deployed and environments studied by each student group in both these courses. These 'digital stories' (sensu France & Wakefield, 2011) were intended to increase levels of engagement by the group as a whole, because each student has to appear and / or narrate a part of each digital story produced. This approach also removes the need to write in length about the nuances of equipment setup or about the nature of the environment. The video diary becomes a means of assessing the students' understanding of the methods deployed as well as competency in their execution. To be able to successfully narrate a piece to camera requires familiarity with the equipment and synthesis of the methodological approach, which cannot be easily glossed over. Furthermore, incorporation of digital video can add some interest to tedious operations such as measuring 100

stones to characterise the grain size of riverbeds and bars. Jarvis & Dickie (2010) and Kemp et al. (2012) review a range of uses for similar podcasts in student learning, among which is the suggestion that they provoke reflective thought (Fisher & Baird, 2006), which in turn fosters deeper levels of learning and engagement (Jarvis & Dickie, 2010; Kemp et al., 2012). As such, these videocasts do not replace fieldwork pedagogy, but augment traditional forms of field-based teaching and learning (cf. Fernandez et al., 2009).

Video productions were awarded marks on the basis of clarity of video and audio, as well as content (grasp of methodology and approach) and overall quality (e.g. use of captions). A single mark was awarded to the group as a whole in both courses. For the residential alpine field course, the video diary was weighted at 10%, while in the campus-based rivers course, it was weighted at 5%. This reflects the time students were expected to spend on their productions as a proportion of total assessment weighting, being a more substantial part of their study away from campus. Three short video diaries (3 to 5 minutes) were produced for the campus course, each describing a single discrete field experiment, including measurement of stream velocity profile, sediment substrate, and pool-riffle bed compaction. A single video diary (up to 10 minutes) was produced for the residential course to capture the range of techniques deployed in the field, including surveying using a Total Station, measurement of discharge, bed shear stress and clast size and roundness. Inevitably the variability of New Zealand's weather may render live video impossible at times, but video diaries could comprise a sequence of stills and / or pan shots with voice-overs. To assist with production and editing, students received briefings from staff, as well as (more latterly) guidance using the instructional paper of France & Wakefield (2011).

Research Methods

The extent to which the introduction of digital video assessment improved understanding and engagement with the methods taught during these courses was assessed using a combination of questionnaires for both courses, as well as a focus group and 'video bus' reflections during the residential field course (Table 1). Post-fieldwork questionnaires used a five point Likert scale as a means to effectively capture student perceptions in connection with each question posed. This provides for a consistency of data capture over several cohorts and different fieldtrips. Furthermore, this approach is simple to administer and provides a means of acquiring rapid feedback from students and as such our intention was to capture as wide a student voice as possible without the need to rely on the commitment of students to attend focus groups, which were not feasible in a non-residential

context. The questionnaire design nevertheless allowed for students to provide personal commentary on their perceptions and answers in connection with the closed questions.

A focus group was used on the residential course to explore in greater detail themes that emerged from the questionnaire answers, adapting an approach using Nominal Group Technique by Fuller et al. (2003). This provided a mechanism to establish the most strongly held perceptions among the group as a whole.

A post-fieldwork video bus also captured students' reflective experiences of the residential fieldwork. This approach provided opportunity for private student reflection in the confines and seclusion of the rear of a minibus. This provided students with their own personal space to work through a series of open questions in their own time, at their own pace, and individually, without involvement of peers, staff or the facilitators of this study. The open questions used to prompt student reflection into the video camera were:

1. What was your most memorable part of the fieldtrip?
2. Were your nightmares confirmed or did your dreams come true?
3. How would you evaluate your role within the group?
4. What recommendations would you give to students taking this paper next year
5. What three words best describe your experiences of this fieldtrip?
6. Any additional comments?

The focus group and video bus (residential course only) were managed by an independent facilitator who was not involved in course instruction. Teaching staff were not involved in these activities and this research followed the lead author's institutional ethical procedures. Questionnaires for both courses were completed entirely voluntarily and in the students' own time. The number, gender and age balance of the student cohorts contributing their perceptions is indicated in Table 2. To conclude, focus group and video bus methods of evaluation were deployed only on the 2010 residential course because these methods work well where students are restricted to the same location off-campus. Additionally, an independent facilitator was in attendance on this trip. These methods proved impossible to arrange and externally facilitate with the distractions and pressures of campus study and home-based living. While ideally all years would draw information from both courses using all evaluation methods, circumstances were restricting. The merit of the results presented here are thus their derivation from three cohorts, two contrasting field settings (campus vs. residential) over three years, providing some breadth to the dataset discussed.

Table 1

Table 2

Results

These results seek to triangulate the students' fieldwork experiences derived from questionnaires for both courses, in addition to focus group and video bus reflections for the 2010 residential course.

Post-fieldwork questionnaire (both courses)

The answers to the closed questions concerning the production of digital videos in the field, ranked on a 1-5 Likert scale, are given in Table 3 for both the campus and residential courses. In order to simply gauge the strength of opinion, responses were categorised by the broad level of agreement / disagreement from all students (100%), almost all students (>90%), most students (>75%), and majority of students (>50%). The results indicate that, in both courses, students perceive digital video favourably in terms of helping them understand methods, landforms, processes and environments. It also fostered group work and helped students prepare for further academic and non-academic work. In open questions relating to their learning, student comments indicate a perceived benefit to their use of equipment and understanding of methodology:

"Enjoyed the chance to produce a film" (Residential)

"Given 'us' more confidence with this type of technology" (Residential)

"Added a new dimension and really helped us understand the methods from a different perspective" (Residential)

"Asked a lot more questions prior to filming, which made sure we really understood the methods prior to videoing" (Residential)

[helped] "understanding how to use the equipment" (Campus)

"Helped my understanding of river processes" (Campus)

"This paper has developed technical skills better than any other paper's fieldwork in general" (Campus)

"Vidcasts increased social skills" (Campus)

Table 3

Focus Group (residential only)

Students participating in the Focus Group were asked individually to rank and score their responses to statements in the post-fieldwork questionnaire, with the most important response receiving a higher score. These rankings were then contributed to the focus group and accumulated to provide an overview of the most important student perceptions. This allows for a sense of the overall group's response and perceptions to the value (or otherwise) of using digital video in this context. These results are given in Table 4 and show that the most important perceived benefit of digital video was in understanding methodology, reinforced by the following student comment:

> *"I have learned to use and better understand the purpose of using the field equipment"... "Can use new equipment confidently*"

In addition, facilitating group work, and understanding landforms and the environment, were also ranked highly by these residential students.

Table 4

Post-fieldwork video bus (residential only)

The open questions on the video bus prompted students to reflect individually on their most memorable aspect of the fieldtrip. All students responded positively and recounted the main fieldwork environments they encountered on the West Coast of New Zealand. These are typified by the following statements, where f denotes a female and m denotes a male respondent, and the number provides anonymous student identification:

> ***"****Going on the glacier and seeing glacial dynamics in action" (f1)*
> *"Living my dream on the glacier and learning about the environment****" (****f6)*
> *"Getting in touch with nature, in the river and on the glacier" (f8)*

The main theme to emerge from more than 60% of the unsolicited additional comments recognised the positive value and importance of the video diary to aid their understanding of the field environment. The statements below illustrate the benefits of creating a video diary:

> *"Video diaries have been good… they take longer, but it makes us have a better understanding than we would have otherwise had." (f2)*

> *"Good learning curve with video - added a new dimension to the trip and helped with our understanding of the environment from a different perspective." (m3)*

> *"[You] pushed us in a positive way with making the video diary, really beneficial to think about the site and situation, environment and what we had to achieve." (m5)*

The students indicated that using the video diary approach made their learning experience memorable, beneficial and fun and is captured in the following quotes:

[Using video was] "A challenging, new experience, really beneficial, makes you think about your environment, setting up shots"(f1)

[Using video provided] "A good sense of engagement" (m3)

"When learning is fun, everyone benefits -staff, students - builds an ethos of enjoyment"(m5)

The importance of group work featured highly, with *"setting of key tasks to individuals to meet deadlines" (m4)* highlighting that *"learning is so much more fun when you throw yourself fully in and work together as a group" (f8).* This illustrates that successful group work is dependent upon full participation. Each student was asked to reflect and evaluate their own role within their group and nearly all recognised themselves as having a supportive or team member role. Only one student alluded to having a more *"leadership and organising role to get things going"* (m4), which suggests some groups may have been lacking natural leaders to help prioritise their workflow.

The cohort contributing their views via the video bus recommended that future (residential) students taking this paper should equip themselves with more subject knowledge prior to the fieldtrip and make sure they are, *"familiar with the fundamentals of glaciology"* (m3) and "*have some prior knowledge about glacial rivers" (f3).*

Overall student perceptions of fieldwork (both courses)

Students were asked for 3 words that best described their experience of the fieldwork on the post-fieldwork video bus and in the campus fieldwork questionnaires. These are displayed using Wordles in Figures 1 and 2, which demonstrate the positive perceptions of students undertaking this fieldwork. The elements of interest and enjoyment are clear, as is value to the learning experience, although these perceptions cannot necessarily be linked explicitly to the use of digital video, since the overall perception of fieldwork was sought.

Figure 1

Figure 2

In the following section the extent to which incorporation of student-generated digital video enhances field-based learning through student experiences and perceptions is discussed. Additionally, the relationship between the creation of digital video in these contexts is mapped against a series of graduate attributes. It is important to note that students were not asked to map their perceived skills against any graduate attributes, rather we map, align and give examples of where the students may attain such attributes. This provides a means to assess the potential contribution of this approach using digital video to develop a range of institutionally-defined graduate attributes.

Discussion and mapping to graduate attributes

The results presented here demonstrate that incorporating digital video into field based experiments has fostered engagement, enjoyment, and interest among student groups, be they on campus or farther afield, and both contexts generate an overwhelmingly positive perception (Figure 1 and Figure 2). In both settings, this approach has improved understanding of methods in particular, although while all residential students perceived this, it was less strongly held by campus students (Table 3 statement 1, and ranked #1 Table 4). Understanding of landforms, processes and familiarity with the environment were all perceived to have been enhanced by use of digital video (Table 3, statements 2 and 3). In addition, this deployment of digital technology has helped students work together in a group, fostering a greater sense of group identity and cooperation (Table 3, statement 4, and ranked #2, Table 4). There are, however, potential pitfalls to be avoided. Notably there should be adequate time for students to experiment with the equipment when presented with "challenging new experiences" (student feedback). Nevertheless, the overwhelming perception of students' experience of digital technology, derived from all methods of evaluation, is positive in a social, developmental and learning perspective. This is in accord with findings of the use of similar digital technology (podcasts) by, for example, Jarvis & Dickie (2010), Kemp et al. (2012), France et al. (2013) and Wakefield & France (2010).

Graduate attributes

The importance here is whether incorporation of digital technology of this nature develops or maps on to key graduate attributes. The findings of this study strongly indicate that digital video actively engages students in fieldwork, but they also develop new communication and presentation skills in their own right, which in turn potentially map on to graduate attributes. These are key transferable skills, which students recognise as having lasting value (Table 3, statement 5). In addition, there was a strong perception in both courses that producing a digital story fostered group work (Table 3

statement 4, and Table 4, ranked #2). The exercise of creating a digital video requires group negotiation, discussion, compromise, "working with peers you normally don't work with" (campus student) and to be effective, successful team working was required, which is a valuable transferable skill to learn and develop, and students perceived that "valuable social skills were developed" (campus student). This agrees with Fisher & Baird's (2006) assertion that collaborative learning is fostered using podcasting, which involves a degree of engagement similar to the videocasting used here. This approach indicates that both subject-specific (learning about processes in the landscape) and more generic skills are developed, such as negotiation and application of knowledge to context.

We believe that digital video incorporated in this field experimental approach to fieldwork is a powerful means of enabling geography educators to support students in developing graduate attributes. In particular the approaches adopted here foster the development of the following skills:

- Ability to work successfully as part of a team (negotiation, collaboration, leadership)
- Builds confidence in learning & acquiring new skills
- Fosters communication skills (oral & visual)
- Potential for creativity (delivery style)
- Improved awareness of context (environment & subject)
- Critical reflection (content selection and editing)

Graduate attributes are institutionally defined characteristics that students should acquire and develop during their time at university. Not all HEIs have published or defined these characteristics, although a number such as Edinburgh (Scotland), Manchester (England), New South Wales (Australia), Otago (New Zealand), and Western Cape (South Africa) have well-defined attributes. However, the scope of graduate attributes and their definition is highly variable, ranging from a minimum of three to more than fourteen. Within this variability, five graduate attributes have been defined by Oxford Brookes University (UK), which can provide a framework on which to map the skills acquired from digital video deployed in this study. Four of the Oxford Brookes graduate attributes are developed via the fieldwork described here: (i) academic literacy via improved development of subject knowledge and methods and membership of a community of practice via testing concepts, in the sense that students participated in local communities of practice (their groups) to collect data and produce their video clips to relate their practice and information to established concepts and ideas in published literature within the wider community of practice; (ii) research literacy via design and execution of project work in the discipline; (iii) critical self awareness and personal literacy via development of the ability to relate to others and function collaboratively, since production of video required group negotiation and discussion, and fostered groupwork and increased social skills; (iv) digital and

information literacy via development of students as confident adopters of a range of technologies for personal and professional use.

The approach to fieldwork in this study maps to all of Keele University's (UK) core graduate attributes; which make students' achievements explicit and provide a common language to articulate their abilities and understanding to non-discipline audiences upon graduation (Keele, 2014) (Table 5). This set of attributes was selected for mapping because they represent concisely those commonly found across higher education institutions around the world and they have been integrated explicitly and effectively as part of the learning experience for undergraduate students at the institution. The creative union of fieldwork and technology in the form of deploying digital video thus develops and reinforces these graduate attributes. The enduring nature and qualities contributed by digital video in these fieldwork settings can be summed up by a student comment (residential): "*Steep learning curve, but good fun and learnt a lot. We will utilise the skills in some form long after the fieldtrip"*.

(Table 5 about here).

A contrasting approach to defining graduate attributes internationally is provided by Massey University, which, at the institutional level, distils the attributes of each of its graduates to three one word statements: 'creativity', 'innovation' and 'connectedness'. The use of digital video for learning readily maps on to each of these graduate attributes: producing an original video is an exercise in creativity (cf. Dando & Chadwick, 2014), the context for use of digital video is innovative, and the entire approach requires students connecting as a team. Mavroudi & Jöns (2011) advocate employing video documentaries in human geography fieldwork to stimulate students' critical thinking. The incorporation of photography and video into digital storytelling has been credited to increase engagement and understanding of key concepts (Wakefield & France, 2010; France & Wakefield, 2011) and aid reflection and collaboration (Jenkins & Lonsdale, 2007; Kuforiji & Williams, 2011).

The findings of this study are in accordance with the benefits identified elsewhere in the use of digital technology to provide a means of reflection and narrative during or following fieldwork, e.g. Kemp et al. (2011). The use of podcasting as a whole has been attributed to provoke reflective thought (Fisher & Baird, 2006) and collaborative learning (Lee et al., 2008). Such qualities map readily onto Institutional graduate attributes and, when applied in a fieldwork context, this ensures that the subject's signature pedagogy remains connected to and informed by best practice, fostering creativity and innovation in learning, and developing graduate attributes beyond the classroom.

Lessons learned

Deployment of digital video has proven to be relatively straightforward, so much so that when asked to make recommendations for future students taking the residential alpine course, respondents in the video bus focused on the need to ensure prior subject knowledge, rather than familiarity with video. Nevertheless, students do require some coaching on video production, to take into account factors such as wind strength and direction which can muffle voice in live video. France and Wakefield (2011) has proven to be an excellent coaching resource to assist with putting a piece to camera together in a thoughtful and coherent manner. Digital video cameras need to be made available for students, although many in fact prefer to use their own mobile devices. Staff also need to be competent in video editing software such as Windows movie maker, which is used to generate the final video product. Staff should also ensure there is adequate time for students to familiarise themselves and experiment with video. This is relatively easy to achieve on a residential course, but challenging when limited by timetable slots on campus. The benefit of generating digital video would also be maximised by clarifying links with other assessments in the paper, so that students can readily see how their video both fits in and augments other assessment. The use of video should also be explicitly related to institutional and subject-specific graduate attributes (as appropriate), to ensure that students appreciate the wider context of their work to their formative learning.

Conclusion

Incorporating digital video fostered subject and methodological understanding, and group co-ordination and co-operation in a range of field experiments in two papers over 3 years. Digital video can be strategically incorporated into a variety of fieldwork (home or away) to enrich the learning space and enhance the student learning experience. Digital video actively engages students in fieldwork methodologies and develops new communication and presentation skills. As such, digital video is a powerful tool that can be mapped against and contribute to development of a range of key graduate attributes via the signature pedagogy of fieldwork.

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Table 1 Methods of evaluation

Evaluation method	Response rate 2010[1] (%)[n]	Response rate 2011[2] (%) [n]	Response rate 2012[2] (%)[n]
Post-fieldwork 'video bus' reflections	100 [14]	-	-
Post-fieldwork questionnaire	86 [12]	75 [15]	83 [20]
Focus group discussion	72 [10]	-	-

[1]Residential Alpine course, [2]Campus-based rivers course

Table 2 Gender and Age representation of course participants

Year	Number	Male	Female	Age >40	Age 30-40	Age <30
2010[1]	14	8	6	2	1	11
2011[2]	20	14	6	0	1	19
2012[2]	24	13	11	0	0	24

[1]Residential Alpine course, [2]Campus-based rivers course

Table 3 Student responses to closed questions in post-fieldwork questionnaire using a 5 point Likert scale (strongly agree, agree, neither agree / disagree, disagree, strongly disagree) for the residential (Alpine) fieldwork course in 2010 and the campus-based courses in 2011 and 2012.

Statement	Response
1. Producing a digital video helped me understand the methods we employed in the field	***all*** *residential students agreed* ***majority*** *of campus students agreed*
2. Producing a digital video helped me understand the landforms and processes we studied in the field	***majority*** *of residential students agreed* ***most*** *campus students agreed*
3. Producing a digital video helped me become familiar with the environment	***most*** *residential students agreed* ***almost all*** *campus students agreed*
4. Producing a digital video helped me work together with my group	***almost all*** *residential students agreed* ***most*** *campus students agreed*
5. Producing a digital video helped me prepare for [further work]	***majority*** *of residential students agreed* ***majority*** *of campus students agreed*
6. Producing a digital video was technically challenging	***most*** *residential students* ***disagreed*** ***most*** *campus students* ***disagreed***
7. Producing a digital video was enjoyable	***most*** *residential students agreed* ***majority*** *of campus students agreed*
8. Producing a digital video was a waste of time	***all*** *residential students* ***disagreed*** ***almost all*** *campus students* ***disagreed***
9. Producing a digital video hindered my study	***majority*** *of residential students* ***disagreed*** ***all*** *campus students* ***disagreed***

All: 100%, almost all: >90%, most: >75%, majority: >50%

Table 4 Focus Group accumulated responses (residential course only)

Producing a video diary...	Score	Rank
Helped me understand the methods we employed in the field	42	1
Helped me work together with my group	35	2
Helped me understand the landforms and processes we studied in the field	34	3
Helped me become familiar with the environment we were working in	27	4
Is something I want to do more often	13	
Helped me prepare for the presentation	11	
Was very time consuming	6	
Was enjoyable	6	
Hindered my study	6	
Was technically challenging	0	
Was a waste of time	0	

Table 5 Mapping digitally-driven fieldwork against graduate attributes

Keele Graduate Attribute	Mapping field-based experiments
GA1 "An open and questioning approach to ideas, demonstrating curiosity, independence of thought…"	Constructing appropriate field methodologies
GA2 "…awareness of dynamic nature of knowledge"	Testing theory and process in river systems
GA3 "Information literacy"	Use of digital technologies
GA4 "Creatively solve problems"	Distilling field methods effectively on camera
GA5 "…recognition of any ethical implications"	Providing students with protocols when using video
GA6 "Ability to communicate clearly in …verbal forms"	Coherent and clear audio delivery
GA7 "Knowledge, skills, self-confidence & self-awareness to actively pursue future goals"	Prepared students for further work
GA8 "Ability to participate responsibly & collaboratively…"	Flexible team working in field and for video production
GA9 "Professional & reflective approach"	Video production required group reflection and synthesis of information
GA10 "Flexibility to thrive in rapidly changing & uncertain external environments"	Fieldwork in an unfamiliar and dynamic landscape

Figure 1 Student perceptions: post-residential fieldwork

www.wordle.net n=42

Figure 2 Student perceptions: post-campus fieldwork

www.wordle.net n=60